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APOLLO PROGRAM DIRECTIVE NO. 34A

MA

REFERENCE COPY

TO : Distribution

FROM:

Sam C. Sullivan
APOLLO PROGRAM DIRECTOR

SUBJECT : Apollo Program CCB Controls and Requirements

OFFICE OF PRIME RESPONSIBILITY (OPR): Apollo Program Control (MAP)

- REFERENCES:
- (a) NPC 500-1, Apollo Configuration Management Manual, May 18, 1964.
 - (b) SE-005-001-1 Rev. A, Apollo Program Specification, March 1966 (Confidential).
 - (c) SE-010-000-1, Apollo Flight Mission Assignments, (effective issue) (Confidential).
 - (d) M-D-MA-1400.005, Apollo Program Directive No. 4 (series) Apollo Program Schedule and Hardware Planning Guidelines and Requirements, (effective issue) (Confidential).
 - (e) NHB 8080.1, Apollo Test Requirements, September 30, 1966.
 - (f) M-S-ML-3200.033, Apollo Program Directive No. 18, Changes to Apollo Hardware and Software for Saturn/Apollo Applications, May 4, 1966.

I. PURPOSE

This directive supplements reference (a) in the areas covered herein. This revision clarifies change criteria and Center to APO reporting requirements.

II. APPLICABILITY

This directive is applicable to all Apollo missions. Center Apollo Program Managers shall institute procedures to implement this directive where such procedures are not already established.

III. CANCELLATION

The following are superseded and cancelled:

M-D-MA-1400.023, APD #14, Change Control of Apollo Space Vehicles at KSC, January 6, 1967.

M-D-MA-1400.063, APD #28, Apollo Program Director Level I Change Approval Requirements, June 16, 1967.

Revisions to previous APD #34 paragraphs or sections are noted by a line in the margins.

SECTION I

CRITERIA AND PROCEDURES FOR CHANGES
REQUIRING LEVEL I CCB APPROVAL

A. APPLICABILITY

All proposed changes falling within the criteria set forth below must be submitted to the Apollo Program Director's Level I CCB for approval. Also, included in this SECTION are procedures for implementing the elevation of approval authority to Level I CCB for all changes after FRT/CDDT, (whichever occurs first for the mission under consideration).

B. CRITERIA

Approval by the Apollo Program Director (Level I CCB) is required for all changes or program actions meeting the following criteria:

1. General Requirements

- a. Any change to Apollo hardware, software, or facilities which will or may result in the inability to meet:
 - (1) the performance, safety, reliability, design and other technical requirements established in the Apollo Program Specifications (Ref. b),
 - (2) the mission objectives, profiles, payload requirements, space vehicle configuration and other requirements in the Flight Mission Assignments Document (Ref. c),
 - (3) the launch dates, hardware and software delivery dates, hardware quantities, and other controlled requirements established in the Program Schedules and Hardware Planning Guidelines and Requirements (Ref. d),
 - (4) the minimum system compatibility tests, all-systems tests, ground qualification tests, ground equipment checkout tests, space vehicle checkout tests, and flight verification tests and other minimum test requirements in the Apollo Test Requirements (Ref. e).
- b. Experiments
Any change in a Manned Space Flight Experiment Board-approved experiment after the initial assignment has been made by the Apollo Program Director.
- c. Inter-Center Changes
All inter-Center changes which do not otherwise meet Level I criteria but cannot be resolved to the mutual satisfaction of Centers concerned.

B. CRITERIA (cont'd)

d. Saturn/Apollo Applications

Any changes to Apollo Program end items to meet the requirements of the Saturn/Apollo Applications Program (Ref. f). (Procedures for requesting change approval for these changes will be the same as for the Routine Procedure set forth in paragraph C.1.a below).

e. Other Changes

Other change categories may be elevated to Level I as determined necessary by the Program Director. In these instances, the required direction will be implemented and, if applicable, this directive will be revised. Temporary elevations of change authority will not be incorporated in this directive.

2. Post FRT/CDDT Changes at KSC

Changes which are to be incorporated between FRT/CDDT and Launch require Level I approval prior to incorporation. Only mandatory changes will be considered and approval by the Mission Director acting for the Program Director will be required. Coordination requirements are set forth in paragraph C.2 below. Changes subject to this control are:

- a. All changes proposed between FRT/CDDT and Launch.
- b. All changes to the Space Vehicle and supporting functional GSE and ESE, approved prior to FRT/CDDT for which incorporation has not been accomplished prior to FRT/CDDT.
- c. Procedural changes which are defined as changes to procedures which change philosophy or intent to the extent the FRT/CDDT may be invalidated. These changes will be acted upon in accordance with latest issue of Apollo Program Directive No. 26, "Preparation of Test and Checkout Plans and Procedures at KSC," and its implementing KSC Launch Operations Directive No. 6, "Preparation and Management of Apollo/Saturn Test and Checkout Procedures (TCP's)."
- d. Changes to Mission Rules other than administrative and typographical corrections.

C. PROCEDURES1. Prior to FRT/CDDT

At any time prior to FRT/CDDT, procedures for requesting approval of Level I changes identified in the criteria of paragraph B.1 are:

a. Routine Procedure

Apollo Program Managers at their respective Centers shall submit to the Apollo Program Director change requests which include results of prior coordination with affected Centers, an assessment, recommendation, and the change package requirements called for in SECTION III to this Directive.

b. Expedited Change Procedure

In the case of either emergency or urgent changes interim approval may be requested from the Apollo Program Director or from his Deputy by telephone or TWX, with the change package to follow in all cases.

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C. PROCEDURES (cont'd)

- c. Changes to space vehicles at KSC which impact a launch date or mission objectives are "urgent" changes. Interim approval will be requested from the Apollo Program Director or his Deputy by telephone or TWX, with the change package to follow in all cases.

2. Post FRT/CDDT

Approval of changes described in B.2 above will be requested from the Apollo Mission Director who is delegated with the change approval authority of the Apollo Program Director during this period. In implementing this requirement, the following apply:

- a. During the Flight Readiness Review each Center shall submit an annotated list (with necessary details) to the Mission Director covering those changes approved prior to FRT/CDDT which have not completed installation at the completion of FRT/CDDT. Work on changes already in process will not be stopped unless specifically disapproved by the Mission Director. The Mission Director will notify each center of any disapprovals.
- b. Potential changes under consideration by MSC or MSFC will be routed to the Mission Director for his review simultaneously with routing to KSC. Should the Mission Director not concur with the proposed change, he will direct KSC to discontinue all activities with respect to the subject change and inform MSC/MSFC immediately.
- c. Except for the assessment by the Mission Director as per b. above, usual Level II inter-Center change procedures shall apply, with final approval by the Mission Director.
- d. All changes, including Field Engineering Changes (FEC's) shall receive expedited handling and may be submitted by telephone to the Mission Director with formal written action to follow. (In the case of FEC's, KSC may approve and authorize installation without prior approval of the Mission Director if required. The Mission Director shall be informed within 24 hours of each such case. Use of FEC's is limited to emergency situations as defined in Section V, B.2.C.)
- e. Each Center shall designate a single point of contact through which change request processing will be funneled to and from the Mission Director.

The Apollo Program CMO will support the Mission Director and shall be a focal point for information flow and documentation of changes in the Mission Director's Office at KSC.

SECTION II

CATEGORIES OF ENGINEERING CHANGES WHICH MAY BE APPROVED AT LEVEL II

A. APPLICABILITY

All proposed changes falling within the categories set forth in para. B may be approved by the Level II CCB's provided they do not impact the criteria requiring Level I CCB approval set forth in Section I.

CATEGORIES

The following categories of changes may be approved by the Level II CCB's:

1. Changes required to assure flight or launch crew safety and/or mission success, i.e., mandatory changes.
2. Changes that will substantially reduce workload or checkout time at KSC. Such changes must be approved by the Level II CCB's and GSE changes from MSFC or MSC must be formally concurred in by the KSC Level II CCB regarding the expected improvement and other assessed KSC impact. Flight hardware changes must be approved, installed, and validated prior to transfer of the vehicle to the pad. GSE changes must be approved, installed and validated prior to FRT/CDDT, whichever is first.
3. Changes that improve the ability to meet launch opportunities by reducing the probability of a delay or scrub when failure history and/or engineering analysis indicates the high probability of an occurrence that could result in missing the launch opportunity. Such changes must be approved by the Level II CCB's and GSE changes from MSFC or MSC must be formally concurred in by the KSC Level II CCB. Flight hardware changes must be approved, installed, and validated prior to transfer of the vehicle to the pad. GSE changes must be approved, installed, and validated prior to FRT/CDDT, whichever is first. These changes must be considered with emphasis on their relationship to the overall KSC checkout flow timing. That is, such changes should only be considered for implementation if their impact is to a critical portion of the checkout flow at KSC in which delays can result in missing the launch opportunity.
4. Occasional down-the-line changes that do not fall completely within the above categories, i.e., certain flight anomaly corrections, etc. These changes must be held to an absolute minimum.

Changes in the above non-mandatory categories will be forwarded for review to the Apollo Program Director's Office (Attention: MAP-6) within 24 hours of the Level II CCB approvals. These changes are to reflect approval by the Center Program Manager or his single designee and, in the GSE cases must contain the joint MSFC/KSC or MSC/KSC approvals. These changes should also

B. CATEGORIES (cont'd)

clearly state the requirement for the changes in terms of the above criteria and include at least the following information:

- (1) CCB Number or other identifier
- (2) Date of approval
- (3) Brief change description
- (4) The expected improvement in workload or checkout time at KSC
- (5) The impact on mission success if not incorporated (if applicable)
- (6) Originating Center's estimate of KSC technician man hours required to install change
- (7) Source or initiator of change, specify which center or contractor
- (8) Where work can be accomplished and at what planned increment in the processing flow at KSC
- (9) Assembly or test constraints associated with each change that can delay the processing flow at KSC
- (10) In the case of spacecraft and L/V changes, itemize the impact of flight hardware changes on associated GSE and software

C. WEEKLY REPORT

1. Each center will submit a "Weekly Status Report of Changes" to include all changes covered in para. B above. This report will be forwarded to the Apollo Program Office CMO (MAP-6) by LDX, Datafax, or equivalent, and will consist of three parts in the recommended format below. An individual report shall be submitted for each Apollo Mission.

ATTN: APO CMO (MAP-6)

SUBJ: Weekly Status Report of Changes Apollo Mission No. _____
For Week Ending (date) _____

PART I - CHANGES APPROVED DURING REPORT WEEK

1	2	3	4	5	6	7
CENTER	CCBD	CCBD	CATEGORY	EST.	CHANGE	CONSEQUENCE OF
CHANGE	NO.	DATE		INSTALL.	DESCRIP-	NOT INCORPORATING
NUMBER				M-HRS.	TION	CHANGE

PART II - UNINCORPORATED CHANGES

PART III - CHANGES INCORPORATED SINCE LAST REPORT

PART IV - OPEN ITEMS

- a. Major work items to be accomplished prior to flight

1	2	3	4
DESCRIPTION	EST. INSTALL.	SCHEDULED	ACTUAL
	M-HOURS	COMPLETION	COMPLETION

- b. Open Waivers and Deviations to CEI Specifications

1	2
DESCRIPTION	STATUS

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C. REPORT FORMAT (Cont'd)

2. Explanatory Notes:

a. Subj: - Fill in Mission Number and date.

b. Part I

Col. 1 - Use the ECP, RECP, CR or other number used by Center to identify the change (i.e., ECP 325)

2 - Self-explanatory

3 - Self-explanatory

4 - Identify category of change by numeral for categories listed below. Additional categories as required shall be written out.

Category No.

- (1) - a. Changes to meet mission requirements
- b. Changes to assure flight or launch crew safety
- c. Changes to assure mission success

(2) - Changes that improve the ability to meet launch opportunities by reducing the probability of a delay or scrub when failure history and/or engineering analysis indicates the high probability of an occurrence that could result in missing the launch opportunity.

(3) - Changes that will substantially reduce workload or checkout time at KSC.

(4) - Changes on late effectivities such as flight anomaly corrections, etc. that do not fall into priorities 1 through 3.

(5) - Documentation only

(6) - Implements previously reported MSC/MSFC/KSC Approved Change

(7) - Changes that do not meet the requirements of any of the priorities #1 through 6.

5 - Provide best estimate of Man-hours to install.

6 - Brief one sentence description of change.

7 - Self-explanatory

c. Part II

List by Center Change Number. Unincorporated changes will continue to be reported in Part II on each weekly report until the change is incorporated (closed out) and reported in Part III.

d. Part III

List by Center Change Number. Once reported no further reporting of that particular change number is required in this Weekly Report.

e. Part IV

List major work items to be accomplished prior to flight. A major work item is any task of more than 100 man-hours which is not covered by an ECP, and was not identified as a planned event at KSC 120 days prior to launch date.

List waivers and deviations to CEI Specifications that have not been approved by the procuring agency.

D. LEVEL III CCB'S

Program Managers are authorized to continue operation of Level III and lower levels of CCB's provided their prerogatives are limited to be consistent with the policies of paragraph B. above.

E. INTERFACE CONTROL DOCUMENTS (ICD'S)

Level "A" interfaces, the juncture between two or more interfacing hardware end items or components which are under the jurisdiction of two or more NASA Centers, are documented by ICD's. Such ICD's are documents establishing inter-Center joint agreements for interface requirements and cannot be unilaterally changed. Interface Revision Notices (IRN's) are used to define changes to an ICD and are the result of hardware, software or requirements changes. Therefore, the IRN shall carry the category (e.g., Mandatory) assigned to that change package of which it is a part. The Kennedy Space Center, Marshall Space Flight Center, Manned Spacecraft Center shall establish uniform inter-Center procedures for processing changes to Level "A" ICD's to assure timely and adequate processing of IRN's.

SECTION IIICHANGE PACKAGE REQUIREMENTSA. ACTION

Each Change Package submitted to the Level I CCB for evaluation and disposition shall include the following:

1. Hardware Changes

- a. The Engineering Change Proposal (ECP) completed in accordance with ANA 445 to the fullest extent possible.
- b. A letter of transmittal signed by the Center Apollo Program Manager.

The transmittal letter shall include:

- (1) Basis for submittal to Level I CCB and urgency of required action;
 - (2) A statement as to whether the change is mandatory for safety reasons or for mission accomplishment, and why;
 - (3) If the change is not mandatory, a brief statement of why approval is recommended;
 - (4) Statement of coordination with other affected Centers.
- c. The Level II Configuration Control Board Directive (CCBD) or appropriate documentation showing approval of the change.
 - d. All significant back-up data used by the Center Level II CCB in formulating a decision or recommendation. Back-up data should include, but not be limited to, the following:
 - (1) The initiating means for change action, if other than the enclosed ECP. Examples: Center Engineering Change Request or letter of recommendation from a Center Director.
 - (2) The basis for evaluation and decision by Center CCB.
 - (a) Engineering assessment of change by responsible office(s);
 - (b) Specification Change Notices. Separate SCN's shall be included for each specification affected by the change. Each SCN shall identify the paragraph(s) to be changed and provide the recommended revised wording. In the event that no specification is affected by the change, an SCN form shall be provided with the statement "No Specification Affected." All specifications shall use a Specification Change Log to report contractually authorized SCN's and the ECP's from which they were generated. At the discretion of the applicable CMO, specification replacement pages may accompany the SCN;
 - (c) Preliminary Interface Revision Notices (PIRN's) for Level A ICD's which must be changed because of the hardware change;

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A. ACTION (cont'd)

- (d) Cost estimate for total change implementation;
- (e) Appropriate drawings, schematics, sketches, photographs or other material which will clarify and assist in understanding the recommended changes. Emphasis shall be placed on demonstrating the necessity for the change and the consequence of not making the change;
- (f) Alternate solutions to the problem including advantages and disadvantages of alternate solutions;
- (g) Schedule impact;
- (h) Software impact. If the change will impact software, the details of the software change are to be included in accordance with the following paragraph.

2. Software Changes

Changes to either the ground or flight computer programs shall comply with the ANA 445 format to the fullest possible extent. Particular attention shall be accorded to impact of software changes on hardware and test and checkout procedures. Change submissions should include all applicable information similar to that listed in paragraph 1 above.

3. Documentation Changes

- a. Proposed changes to Level A Interface Control Documents (ICD's) or the Apollo Program Specification which are not the result of a hardware change or will not result in a hardware change will be submitted by a Requirements ECP prepared in accordance with NPC 500-1, Exhibit VIII, Para. 6.3. Particular emphasis will be placed on describing the reason for the change (e.g., "as built" does not meet documentation requirements; however, hardware "as tested" satisfies operational requirements, etc.).
- b. A letter of transmittal signed by the Center Apollo Program Manager. The transmittal letter will include:
 - (1) Basis for submittal to Level I CCB and urgency of required action;
 - (2) Statement of coordination with other affected Centers;
 - (3) Citation of specific paragraphs of the Apollo Program Specification and the essential changes which are proposed;
 - (4) Statement of estimated program schedule and cost impact of not approving the proposed change.
- c. Level II CCBD and associated change package.
- d. Preliminary Interface Revision Notices (PIRN's) for proposed ICD changes.

4. Changes to Controlled Milestone Schedules and Hardware Quantities

Proposed changes to controlled milestone schedules and hardware quantities which are set forth in reference (d) will be submitted in accordance with procedures established in reference (d). Schedule changes resulting from hardware changes will be included in the hardware change package defined in 1. above.

SECTION IV

CONFIGURATION MANAGEMENT REPORTING REQUIREMENTS

A. SCOPE

This section defines the Center to APO Configuration Management Reporting requirements and as such incorporates, condenses and supersedes all prior correspondence and directives on this subject.

APPLICABILITY

This section is applicable to all program levels where hardware, software, and facility changes are initiated, approved and implemented. It is expected that the Apollo Program Manager at each MSF Center will be the focal point for this coordinated and timely reporting of configuration management data.

C. ACTIONS

Wherever possible the APO data requirements should be fulfilled by use of current center configuration management reports. Reporting requirements are explained below. The Apollo Program Office CMO (MAP-6) shall be included on any distribution required for submittal to the Apollo Program Director.

1. Level II and III CCBD's

The Apollo Program Office CMO (MAP-6) shall be placed on the distribution list for a copy of all Level II and Level III CCBD's. Each week, Centers shall forward all CCBD's accumulated during the preceding week. Submission shall be made on a continuing basis irrespective of space vehicle or mission effectivity, and is independent of the weekly status report required by Section II, C. CCBD's concerned with stage engines shall also be submitted.

CCBD's thus provided will be used to increase visibility of the Program Director in respect to trends in types and numbers of changes, assist in tracking of configuration differences, and to provide information for periodic reports to the Associate Administrator, Office of Manned Space Flight.

2. CCB Agenda and Minutes

The Apollo Program Office CMO (MAP-6) shall be placed on the distribution list for the agenda and minutes of Level II and Level III CCB's/CCP's.

3. Weekly Status Report of Changes

The requirements for this report are defined in Section II, C of this directive.

C. ACTIONS (cont'd)

4. Configuration Differences

A separate report shall be issued by each Center (as defined below) which delineates all configuration differences (with significant configuration differences flagged) from the baseline configurations. These reports shall be submitted to the Apollo Program Office (MAP-6). The level of detail presented should be adequate to present a clear understanding of the configuration difference and the reason for the configuration difference.

a. KSC

The baseline configuration against which configuration differences will be reported is the Launch Complex configuration for AS-503.

This report is to include those facility and hardware systems that play an active role in the launch operations phase and is to pay particular attention to changes involving major interfaces; system or subsystem addition or deletion; ground and flight crew safety factors, items whose failure could cause significant impacts such as launch scrub, LV shutdown after launch release, etc.; functional differences; and items requiring additional testing.

b. MSC

The baseline configuration against which configuration differences will be reported are CSM 106 and LM-5.

This report is to include the CSM, LM and associated GSE configuration differences and is to reflect differences in major interfaces, subsystems or major components including additions or deletions, individual subsystems performance, weight, factors of safety and crew safety. The comparison must also reflect any ground test program hardware configuration and functional variances from the baseline.

c. MSFC

The baseline configuration against which configuration differences will be reported is L/V 504.

This report is to include the Saturn V Launch Vehicle Stages, engines and associated GSE configuration differences and is to reflect differences in major interfaces, subsystems or major components including additions or deletions, individual subsystems performance, weight, factors of safety and crew safety. The comparison must also reflect any ground test program hardware configuration and functional variances from the baseline.

C. 4. c. (cont'd)

For purposes of these reports, "significant differences" are defined as those differences that involve major interfaces, system or subsystem addition or deletion, factors involving ground and flight crew safety, functional differences, LV, S/C and LM weight differences and items requiring additional testing.

As a minimum, the following data shall be included in the report to the Apollo Program Office: Effectivity of the difference, description of the difference, reason, applicable system or subsystem affected, and the category of the significant difference (i.e., weight, factor of safety, interface impact, etc.)

5. ICD/IRN Status

The status of ICD's/IRN's will be compiled and published monthly in the Interface Control Document Log. Data inputs shall be supplied to R-P&VE-VND at MSFC by the responsible interface panels by completely filling out the Interface Log Input Form (MSFC Form 2053 Rev. April 1968; refer to latest issue of MSFC's CM-001-001-1A).

Each Center shall supply on a monthly basis the status of open ICD's and IRN's - the status shall include: scheduled and actual dates of both technical and CCB approval; the date and number of the CCB; the contractual implementation date as the information becomes known; and the appropriate Program Control Number (PCN).

The responsible interface panel shall supply on a monthly basis through its Executive Secretariat member a listing of all inter-Center ICD's against vehicle effectivities.

6. Twenty Four Hour Report

This report applies to those non-mandatory change categories defined in Section II, para. B. The requirements for this report are defined in Section II.

SECTION V

CONTROL OF OPEN WORK AND HARDWARE CHANGES AT KSC

A. APPLICABILITY

This SECTION is applicable to all Space Vehicle hardware, software and supporting GSE furnished by MSC and MSFC from time of delivery at KSC to launch, as well as KSC furnished equipment and facilities.

B. ACTION

Center Apollo Program Managers shall establish procedures to implement the following:

1. Open Work at KSC

As a matter of policy, all hardware, including approved changes, will be completed at contractors' plants prior to delivery to KSC. It is recognized, however, that there are circumstances where it is to the advantage of the Program to deliver hardware with work remaining to be completed at KSC, including unincorporated changes. Such remaining "open work" can affect realistic planning and adherence to integrated daily work schedules at KSC. To ensure proper consideration of this factor in the planning and execution of KSC's responsibilities in meeting established launch dates, KSC Apollo Program Manager shall concur in decisions prior to delivery of Space Vehicle and supporting GSE hardware with "open work" remaining to be accomplished at KSC.

2. Hardware Changes at KSC

a. As a matter of policy, after arrival of Space Vehicle and Supporting GSE hardware at KSC, every effort will be made to limit changes to the mandatory category, Section II,B,1, although changes in the categories of Section II,B,2&3 may still apply. Responsibility for controlling changes remains with MSFC for the Launch Vehicle and MSC for the spacecraft except as KSC has been specifically delegated change authority by MSFC and MSC.

(1) As required in SECTION I, paragraph B.1, when proposed changes to any space vehicle hardware at KSC have an impact on the established launch date or planned mission objectives, these changes are considered to be Level I, and as such must be submitted to the Apollo Program Director for his approval.

(2) Evaluation as to whether a proposed change affects schedules should be based on impact on the following key milestones at KSC:

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B. ACTION (cont'd)

- (a) Applying power to launch vehicle
 - (b) Spacecraft mechanical and electrical mating to launch vehicle
 - (c) Space vehicle overall test
 - (d) Countdown demonstration test (CDDT)
 - (e) Flight Readiness Test (FRT)
 - (f) Launch date
- b. All requests for changes submitted by KSC to MSC or MSFC, shall be approved by the KSC Apollo Program Manager or his Deputy prior to submission.
- c. Field Engineering Changes and Expedited ECP's originated at KSC for the correction of emergency situations may be implemented upon approval of the cognizant MSFC or MSC Senior Resident Manager at KSC. As soon as possible thereafter, the FEC or Expedited ECP shall be followed by a formal ECP. One ECP shall be prepared for each FEC or Expedited ECP.

An emergency situation exists when an engineering change is required to:

- (1) prevent bodily harm
- (2) prevent serious damage to equipment
- (3) complete a scheduled test, the delay of which would seriously impact the ability to comply with program commitments or schedule milestones.
- (4) prevent a shutdown when the shutdown would impact the ability to meet program commitments or schedule milestones.

3. Change Incorporation Status at KSC

KSC shall maintain a system that provides individual change incorporation status for spacecraft, launch vehicle, GSE, and facilities at KSC.

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MAP-7/Webster
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MAT/Summerfelt
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MAS/Wagner (4)
MAS-1/Boysen
MAS-3/Menard
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MAL-1/Green
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